DOCUMENT RESUME

ED 274 788 CE 045 124

AUTHOR Reneau, Fred; And Others
TITLE Computerized Numerical Control Test Item Bank.
INSTITUTION Illinois State Board of Education, Springfield. Dept. of Adult, Vocational and Technical Education.; Southern Illinois Univ., Carbondale. Dept. of Vocational Education Studies.; Vocational Technical Education Consortium of States, Atlanta, Ga.
PUB DATE 86
NOTE 67p.; For a related curriculum guide, see CE 045 123.
PUB TYPE Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Automation; Competency Based Education; Computer Software; *Criterion Referenced Tests; Electronic Control; *Equipment Utilization; *Machine Tools; *Numerical Control; Postsecondary Education; *Programing; *Technical Education; Test Items
IDENTIFIERS Vocational Technical Education Consortium States

ABSTRACT

This guide contains 285 test items for use in teaching a course in computerized numerical control. All test items were reviewed, revised, and validated by incumbent workers and subject matter instructors. Items are provided for assessing student achievement in such aspects of programming and planning, setting up, and operating machines with computerized numerical control as developing programmed instructions, selecting manual or computer-assigned programs and matching them with program/language definitions, matching machine tools and holders with parts, determining speeds and operating modes, computing tool coordinates and workpiece geometries, verifying cutter paths, plotting programs, defining cutter paths, programming tool change procedures, preparing operating instructions for piece parts, matching codes with responses, calculating running times, preparing tapes, writing manual programs, programming with purchased software, designing special features for custom jobs, repairing broken tapes, updating programs for engineering changes, determining job priorities, scheduling programs, checking tooling sheets, installing and loading tools, making dry runs of programs, adding and altering commnands, editing programs running segments of programs, performing sequence searching, and resetting equipment. Each test item is designed to serve as an evaluation tool for use with Vocational-Technical Education Consortium of States (V-TECS) curriculum guides and is accompanied by a code that contains information about the duty area, task number, performance guide number, and learning domain area/level of the skill being evaluated in the item. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

467

IL 86 13314

ED274788

Computerized Numerical Control

Test Item Bank

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

D Gill

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

V-TECS

VOCATIONAL—TECHNICAL EDUCATION CONSORTIUM OF STATES

BEST COPY AVAILABLE

CE014127

V-TECS TEST ITEM BANK

FOR

COMPUTERIZED NUMERICAL CONTROL

Prepared by

Fred Reneau, Project Director
David Hahn, Research Specialist
James Legacy, Co-Director
Rebecca McKee, Research Assistant
Kate Bergerhouse, Research Assistant
Bob Vogler, Research Assistant
Department of Vocational Education Studies
Southern Illinois University
Carbondale, IL 62901

in cooperation with

Peggy Pool, Technical Coordinator
Department of Adult, Vocational and Technical Education
Illinois State Board of Education
Springfield, IL 62777

1986

ACKNOWLEDGEMENTS

The Computerized Numerical Control Test Item Bank was developed with the help of computer equipment repairers and educators in Illinois.

V-TECS Technical Coordinator
Peggy Pool
Department of Adult, Vocational and Technical Education
Illinois State Board of Education
Springfield, IL 62777

V-TECS Director
Ronald McCage
Vocational-Technical Education Consortium of States
795 Peachtree St. NE
Atlanta, GA 30365

CNC Incumbents

Gary Hanley
CNC Programmer
General Electric
Carbondale, IL 62901

Marvin Graff
CNC Programmer
Box 520
Herrin, IL 62948

Randy Billingsley
CNC Machine Operator
Rt. 13 East and Lake Road
Carbondale, IL 62901

Tracy Hatfield
CNC Tool Programmer
3828 North River Road
Schiller Park, IL 60176

Pete Shields
CNC Operator
Teledyne Pines
Aurora, IL 60506

Ron Stewart
CNC Programmer
P.O. Box 65
Herrin, IL 63948

Randy Stewart
CNC Machine Operator
P.O. Box 65
Herrin, IL 62948

CNC Instructors

James Hill
CNC/Shop Instructor
Eldorado High School
Eldorado, IL 62930

Albert Zechweija
CNC Instructor
Triton College
River Grove, IL 60171

Don Bridgeman
CNC Instructor
Sauk Area Career Center
138 Crawford
Robbins, IL 60472

Rich Poulan
CNC Instructor
Illinois Central College
East Peoria, IL 61635

James Stanek
CNC Instructor
Stephenson Area Career Center
Pearl City Road
Freeport, IL 61032

Gil Hagen
CNC Instructor
Western Illinois University
IE & IT Departments
Macomb, IL 61455

Mark Meyer
CNC Instructor
College of DuPage
22nd & Lambert Rd.
Glen Ellyn, IL 60137

Don Haas
CNC Instructor
Illinois Valley Comm. College
R.R. 1
Oglesby, IL 61348

Gary Volk
CNC Instructor
Illinois Central College
East Peoria, IL 61611

Gregory Habbas
CNC Instructor
Prairie State Collge
202 South Halsted
Chicago Heights, IL 60411

Larry Sweeny
CNC Instructor
Decatur AVC
300 East Eldorado
Decatur, IL 62523

Robert Lawrence
CNC Instructor
Kishwaukee College
P.O. Box 29
Malta, IL 60150

W. Hack
CNC Program Coordinator
William Rainy Harper Coll.
Algonquin & Roselle Roads
Palatine, IL 60067

Tony Soul/ Maurice Munch
CNC Instructors
Elgin Community College
1700 Spartan Drive
Elgin, IL 60120

Bryan Keese
CNC Instructor
Moraine Valley Comm. Coll.
10900 South 88th Ave.
Palos Hills, IL 60456

INTRODUCTION

V-TECS test item banks are designed to provide evaluation tools for use with V-TECS curriculum guides. Each test item bank consists of matching questions, multiple choice questions, and performance checklists. The test items and performance checklists are coded to identify the V-TECS curriculum guide's duty area, task number, performance guide (step) number, and learning domain area/level. A test item code of A-002-6-C1 identifies the following:

A = duty area

002 = task number

6 = performance guide (step) number

C1 = learning domain area/level

(C = cognitive learning domain area)

(1 = simple recall)

The duty areas composed of groups of related tasks performed by incumbent workers. The guides include enabling objectives, resources, teaching activities, criterion referenced measures, and performance steps. The performance steps specify the sequence of steps used to complete one particular task. The learning domains include cognitive, psychomotor, and affective areas. Each learning domain has multiple levels of learning:

Cognitive domain ---

C1 = simple recall

C2 = comprehension

C3 = application

C4 = analysis

C5 = synthesis

C6 = evaluation

Psychomotor domain ---

P1 = imitation

P2 = manipulation

P3 = precision

P4 = articulation

P5 = naturalization

Affective domain ---

A1 = receiving

A2 = responding

A3 = valuing

A4 = organizing

A5 = characterizing

The V-TECS test item banks are not designed to provide all possible test items. These test items were developed to include the essential (need to know) information as identified by the writing team and review team or instructors and incumbent workers. Test items can be omitted, changed or added at the discretion of the instructor.

The Computer Equipment Repair test items and Computerized Numerical Control test items were reviewed, revised, and validated by incumbent workers and subject matter instructors.

CNC TEST ITEMS

Objective # 1
Task: Develop programmed instructions from blueprint.

Code: A-001-4-C1

1. Match the machining process with its feed or speed formula.

1.	Drilling cutting speed	a.	T=L / F
2.	Turning cutting speed	b.	Vt=D * π * n / 12
3.	Milling cutting speed	c.	Vm=D * π * n / 12
4.	Drilling rate of metal removal	d.	HPs=K * Qd
5.	Turning rate metal removal	e.	Vc=d * π * n / 12
6.	Milling rate of metal removal	f.	Qd=A * n * F
		i.	Qt=W * F * N * C
		j.	Qm=W * T * T
		k.	V=D * π * n / 12

ANSWERS: 1-e, 2-b, 3-c, 4-f, 5-g, 6-j

Code: A-001-6-C1

2. The program manuscript is a:
   A. general term which refers to any storage media for binary data.
   B. portion of a computer exclusive of the input, output, peripherals and storage units.
   C. logic matrix that describes a logic function by listing all possible combinations.
   D. form used by a programmer for listing detailed manual or computer part programming instructions.

   ANSWER: D

Objective # 2
Task: Develop programmed instruction from piece part.

Code: A-002-10-C1

3. A machining instruction set is the:
   A. list of machine language instructions which a computer can perform.
   B. set of repetitive computations in which the output of each step is the input to the next step.
   C. sequence of signals for communication between system functions.
   D. physical means of connecting one location to another for transmitting and reviewing data.

   ANSWER: A

Code: A-002-11-C1

4. The definition of the workpiece geometry, tools motions and commands, in an CNC part programming language such as APT, ADAPT etc. is commonly referred to as the:
   A. calling sequence.
   B. decimal code.
   C. computer part program.
   D. diagnostic program.
   ANSWER: C

Objective # 3
Task: Draw sketch of desired workpiece.
Code: A-003-2-C1

5. Match the type of projection with projection definition.

Type of projection	Projection definition
1. Orthographic	a. The view of an object that has been placed so that two of its axes make equal angles with the plane of projection.
2. Isometric	b. The view of an object in which all three faces are equally inclined to the drawing surface so that all the edges are equally fore-shortened.
3. Perspective	c. The view of an object using one plane with the object positioned so that three faces are displayed.
4. Oblique	d. The view of an object shown much as the human eye or camera would see it from a common or station point.
5. Axonometric	e. The view of an object obtained when each of the three axes makes a single angle with the plane of projection.
6. Dimetric	f. The view of an object obtained by the motion of a geometric line, either straight or curved.
7. Trimetric	g. The view of an object that is produced by using paralled projectors that make some angle other than 90 degrees with the plane of projection.
	h. The view of an object positioned so that a single view such as top, front or side is visable on the drawing surface.

ANSWERS: 1-h, 2-b, 3-d, 4-g, 5-c, 6-d, 7-e.

Code: A-003-4-C1

6. A guage, pattern or mold used as a guide to draw a object or letter is called a:
   A. T-square.
   B. Template.
   C. Protractor.
   D. 45 degree triangle.
   ANSWER: B

Code: A-003-1-C1

7. Match common tool drawing terms with the definitions.

Common tool drawing terms	Definitions
1. Kerf	a. To bevel an external edge or corner.
2. Flange	b. The angular or curved contour of the outer surface of a part.
3. Lug	c. A groove or channel cut by a saw or some other tool.
4. Neck	d. To cut a circumferential groove around a shaft.
5. Rib	e. A thin component of a part that acts as a brace or support.
6. Round	f. A projecting rim added on the end of a fitting for making a connection.
7. Chamfer	g. A rounded external corner on a casting.
	h. A rounded filling which increases the strength at a junction of two surfaces.
	i. A projection or ear which provides support or allows the attachment of another part.

ANSWERS: 1-c, 2-f, 3-i,4-d, 5-e, 6-g, 7-a

Objective # 4
Task: Select manual or computer-assigned program.

Code: A-004-4-C1

8. Match program/language with program/language definition.

8. (cont.)

Program/Language Name	Program/Language Definition
1. Assembler	a. A computer program which calculates the cutter location based on motion commands.
2. BASIC	b. An algebric procedure-oriented computer language.
3. COBOL	c. Computer language developed for people who have little or no previous knowledge of computers.
4. APT	d. Computer language written in a series of bits which are understandable by, and therefore instruct, a computer.
5. JCL	e. An assembly language used by the IBM 360 computer.
6. Machine language	f. A pseudo-standard system for computer-aided N/C programming.
7. MDI	g. A means of inserting data manually into the control system.
8. Source language	h. A business data processing language.
9. BAL	i. A language used to communicate with the operating system.
10. FORTRAN	j. An N/C language on input tape changing the mode of operation of the control.
	k. A symbolic language comprised of statements and formulas used to specify computer processing.
	l. A series of computer instructions to perform a specific task for many other routines.
	m. A computer-aided N/C programming language and processor.
	n. A computer program which converts a symbolic language program into an executable object program.

ANSWERS: 1-n, 2-c, 3-h, 4-f, 5-i, 6-d, 7-g, 8-k, 9-e, 10-b.

Code: A-004-1A-C1

9. Match the types of programming with programming definitions.

Types of Programming	Programming Definitions
1. Computer-aided program	a. A series of computer instructions to perform a specific task for many other routines.
2. Manual part programming	b. A specific and complete set of data and instructions for the purpose of manufacturing a part on a N/C machine.
3. Microprogramming	c. A programming technique in which a segment of a larger program is executed iteratively (looping) until a specific data condition is detected.
4. Multiprogramming	d. A programming technique in which two or more programs are operated on a time-sharing basis.
5. Nesting	e. A programming technique in which multiple instruction operations can be combined for greater speed and efficient memory use.
6. Part Programming	f. A programming technique in which a manuscript in machine control language and format is prepared to define a sequence of commands for use on a N/C machine.
	g. A programming technique in which a set of data and instructions written in source languages is provided for control of a N/C machine.

ANSWERS: 1-g, 2-f, 3-e, 4-d, 5-c, 6-b.

Objective # 5
Task: Choose machine tools for part.

Code: A-005-5-C1
10. Match tool name with tool function.

Tool Name	Tool function
1. Drill	a. Removes a small amount of material from a previously produced hole.
2. Tap	b. Produce threads in previously produced holes.
3. Reamer	c. Produce a head hole flush with the material surface.
4. Boring bar	d. Remove metal from face or contouring workpiece edge.
5. End mill	e. Produce a smooth circular hole in material.
	f. Produce extremely accurate finishes positioning within tenths and holding roundness within millionths.

ANSWERS: 1-e, 2-b, 3-a, 4-f, 5-d.

Code: A-005-6-C1
11. The innovation of what type of insert tools have allowed for faster cutting speeds and feeds thereby improving and maximizing productivity levels.
A. high speed steel.
B. steel.
C. carbide.
D. cobalt.
ANSWER: C

Objective # 6
Task: Select tools and holders.

Code: A-006-6-C1
12. The basic function of a typical fixture is to locate and secure the:
A. tool holder.
B. workpiece.
C. tool.
D. spindle arm.
ANSWER: B

Code: A-006-9-C1
13. When using CNC terminology a "T" word usually refers to a:
A. tool function.
B. tab format.
C. track location.
D. temporary storage.
ANSWER: A

Objective # 7
Task: Select spindle speed.

Code: A-007-5-C1
14. When converting cutting rate to revolutions per minute the following formula is used (rpm = sfm x constant divided by D). In the formula sfm stands for surface:
A. feed per minute.
B. feet per meter.
C. feed per millimeter.
D. feet per minute.
ANSWER: D

Code: A-007-1-C1
15. The main function of the spindle on a lathe is to:
A. hold the workpiece stationary.
B. provide motion for the machining process.
C. hold the tool stationary.
D. provide motion for the tool.
ANSWER: B

Objective # 8
Task: Select feedrate for axis travel.
Code: A-008-1-C1
16. A coded number read from tape which describes the feedrate function is called the feedrate:
A. signal.
B. bypass.
C. number.
D. resolution.
ANSWER: C

Code: A-008-5-C1
17. The relative motion between the tool and the work due to the motion of the programmed axis or axes is called the:
A. feed function.
B. zero shift.
C. step response.
D. object program.
ANSWER: A

Code: A-008-5-C1
18. The formula for converting feed to feedrate for a drilling process is, feedrate = feed x spindle:
A. horsepower.
B. torque.
C. size.
D. speed.
ANSWER: D

Code: A-008-4-C1
19. Feedrate for axis travel is usually expressed in:
A. centimeters or feet per minute.
B. meters or yards per minute.
C. millimeters or inches per minute.
D. decimeter or inches per minute.
ANSWER: C

Objective # 9
Task: Position workpiece in relation to machine axis.

Code: A-009-2-C1
20. A principle direction movement of the tool or workpieces or one of the reference lines of a coordinate system is referred to as the:
A. benchmark.
B. axis.
C. format.
D. vector.
ANSWER: B

Code: A-009-3A-C1
21. The axis which is horizontal and parallel to the work holding surface is axis:
A. Z
B. C
C. Y
D. X
ANSWER: D

Code: A-009-3-C1
22. When positioning the workpiece in relation to the machine axis, the depth of the part usually corresponds to axis:
A. Z
B. Y
C. X
D. W
ANSWER: A

Code: A-009-4-C1
23. The axis which is an angle defining rotary motion around the X-axis is:
A. X
B. C
C. A
D. H
ANSWER: C

Objective # 10
Task: Determine absolute or incremental mode.

Code: A-010-2-C1
24. A dimensioning method in which a dimension is expressed with respect to the preceding point in a sequence of points is called:
A. absolute.
B. incremental.
C. coordinate.
D. cartesian.
ANSWER: B

Code: A-010-3-C1

25. A dimensioning method in which a dimension is expressed with respect to the origin of a coordinate system is called:
    A. accumulated.
    B. incremental.
    C. proportional.
    D. absolute.
    ANSWER: D

Code: A-010-3-C2

26. If a piece part had incremental dimensions of 1", 2", 1", 4", the absolute dimensioning would be:
    A. 1", 2", 3", 4".
    B. 1", 3", 4", 8".
    C. 3", 4", 5", 8".
    D. 1", 2", 3", 8".
    ANSWER: B

Objective # 11
Task: Compute polar/rectangular coordinates.

Code: A-011-3-C1

27. A coordinate system whereby the position of a point, line or plane can be defined with reference to a set of axes at right angles to each other. Also known as the rectangular coordinate system.
    A. Polar.
    B. Cylindrical.
    C. Absolute.
    D. Cartesian.
    ANSWER: D

Code: A-011-3-C1

28. A coordinate system whereby the position of the point, line or plane can be defined in terms of a radius and the angle between the positive X-axis and the geometric shape. Also called the cylindrical coordinate system.
    A. Polar.
    B. Absolute.
    C. Precision.
    D. Cartesian.
    ANSWER: A

Objective # 12
Task: Compute workpiece geometry.

Code: A-012-2-C1

29. The elimination of nonsignificant zero's to the left or right of the most significant digits is referred to as zero:
    A. offset.
    B. shift.
    C. suppression.
    D. function.
    ANSWER: C

Code: A-012-3F-C1
30. The distance the tool travels beyond the command position is referred to as:
A. overlay.
B. overtravel.
C. parity.
D. override.
ANSWER: B

Objective # 13
Task: Verify cutter path.

Code: A-013-2A-C1
31. A drawing which describes the path of the cutting tool as it progresses around a part is called a:
A. read-out.
B. track.
C. roadmap.
D. manuscript.
ANSWER: C

Code: A-013-1-C1
32. Programmed points connected by a series of straight line movements resulting in the desired contour is referred to as what type of interpolation:
A. circular.
B. programmed.
C. lateral.
D. linear.
ANSWER: D

Code: A-013-2B-C1
33. The type of interpolation which allows cutting tool to be programmed to move in a circular path ranging from a small arc to a full 360-degree span is:
A. circular.
B. programmed.
C. Lateral.
D. Linear.
ANSWER: A

Objective # 14
Task: Plot program.

Code: A-014-1-C1
34. A computer program developed to serve as a translating system for a parts programmer to develop a mathematical representation of a geometric form with the use of symbolic notation is called a:
A. frequency response analysis processor.
B. binary number system processor.
C. programmed dwell processor.
D. general N/C language processor.
ANSWER: D

Code: A-014-3-C1
35. Plot Programs written using a specific language or features of a particular computer are referred to as:
A. computer aided.
B. computer dependent.
C. closed loop.
D. communication link.
ANSWER: B

Code: A-014-5-C1
36. A device which will draw a plot or trace from coded N/C data input is called a:
A. tracer.
B. interpolator.
C. plotter.
D. invertor.
ANSWER: C

Objective # 15
Task: Depict part graphically.

Code: A-015-2-C1
37. Any system that uses a computer in the creation or modification of graphic designs is commonly called:
A. CAD
B. CAM
C. CAN
D. CAAD
ANSWER: A

Code: A-015-1-C1
38. Match the computer aided program initial with the program.

Initials	Program
1. CAM	a. Computer-Aided Methology Instruction
2. CAD	b. Computer-Aided Design
3. CIM	c. Computer-Aided Manufacturing
4 CAMI	d. Computer-Aided Data
	e. Computer-Aided Mode
	f. Computer-Integrated Manufacturing
	g. Computer-Instruction Manual
	h. Computer-Aided Manufacturing International

ANSWERS: 1-c, 2-b, 3-f, 4-h

Objective # 16
Task: Define cutter path.

Code: A-016-2-C1
39. The part of the software which converts the cutter path coordinate data into a form which the machine control can interpret correctly is called the:
A. post processor.
B. programmed dwell.
C. prepartory function.
D. general processor.
ANSWER: A

Code: A-016-3-C1

40. The distance from the part surface to the axial center of a cutter is known as the cutter:

A. dimension.
B. path.
C. offset.
D. compensation.

ANSWER: C

Code: A-016-5-C1

41. The path defined by the center of a cutter is called the cutter:

A. path.
B. center line.
C. dimension line.
D. offset.

ANSWER: A

Objective # 17
Task: Operate post processor.

Code: A-017-2-C1

42. The main purpose of the post-processor is to:

A. coordinate programming instruction and specifications.
B. measure a position and convert this measurement into a transmission form.
C. convert cutter path coordinate data into a form which the machine control can interpret correctly.
D. distinguishes positive from negative numbers.

ANSWER: C

Code: A-017-1-C1

43. The post-processor is a part of the:

A. computer.
B. NC software.
C. NC machine.
D. core memory.

ANSWER: B

Objective # 18
Task: Write post processor.

Code: A-018-3-C1

44. The main purpose of the general processors is to:

A. copy all or part of the contents of a storage device.
B. provide a visual presentation of data.
C. use numerical characters to express or represent data.
D. convert geometric input data into cutter path data.

ANSWER: D

Objective # 19
Task: Program tool change procedure.

Code: A-019-4-C1
45. There are two basic types of tool changes, they are:
A. vertical and horizontal.
B. vertical and diagonal.
C. front load and back load.
D. upright and reclining.
ANSWER: A

Code: A-019-2-C1
46. The major advantage of a numerically controlled tool changer is:
A. the operator loads each tool.
B. it performs a number of different operations with multiple setups.
C. it changes its own tools.
D. it needs no programming to function.
ANSWER: C

Code: A-019-5-C1
47. The numeric code appearing on an N/C tape which is used to select a desired tool on a machine tool is called a:
A. M word.
B. G word.
C. S word.
D. T word.
ANSWER: D

Code: A-019-3-C1
48. Horizontal tool changers are commonly referred to as a:
A. firmware center.
B. cross assembler.
C. machining center.
D. block assembler.
ANSWER: C

Objective # 20
Task: Prepare operator instructions for piece part.

Code: A-020-1-C1
49. Match the "G" command with its Response.

"G" command	Response
1. G00	a. Circular interpolation in clockwise direction.
2. G01	b. Dwell cycle.
3. G02	c. Linear direction movement.
4. G03	d. Absolute mode.
5. G04	e. Present coordinate values.
6. G90	f. Incremental mode.
	g. Circular interpolation in counter clockwise direction.
	h. Rapid transverse movement.

ANSWERS: 1-h, 2-c, 3-a, 4-g, 5-b, 6-d
Note: G-codes can be machine specific and may vary for different machines.

Code: A-020-2-C1
50. Match the M codes with it's Response.

"M" codes		Response	
1.	M00	a.	End of program.
2.	M02	b.	Spindle start clockwise direction.
3.	M03	c.	Program stop.
4.	M04	d.	Tool change position
5.	M05	e.	Spindle stop
6.	M06	f.	Spindle start counter clockwise direction.
		g.	Optional stop.
		h.	Turn coolant on.

ANSWERS: 1-c, 2-a, 3-b, 4-f, 5-e, 6-d.

Code: A-020-1-C1
51. Match the G codes with it's Response.

"G" codes"		Response	
1.	G40	a.	Taper tilt to the right.
2.	G41	b.	Cancel offset.
3.	G42	c.	Stop movement.
4.	G50	d.	Offset to the right.
5.	G51	e.	Cancel taper tilt.
6.	G52	f.	Taper tilt the left.
		g.	Cancel previous cycle.
		h.	Offset to the left.

ANSWERS: 1-b, 2-h, 3-d, 4-e, 5-f, 6-a.
Note: G-codes can be machine specific and may vary for different machines.

Objective # 21
Task: Calculate run time.

Code: A-021-B4-C2
52. Given an SFPM of 200 and a tool diameter of 1 inch what would be the RPM?
SFPM=Surface Feet Per Minute.
RPM=Revolutions Per Minute.
A. 191
B. 200
C. 382
D. 764
ANSWER: D

Code: A-021-B5-C2
53. Given the feed per revolution of .006 and the RPM of 250, what would the feed per minute be?
RPM=Revolutions per minute.
A. .75
B. 1.5
C. 6
D. 250
ANSWER: B

Objective # 22
Task: Prepare tape.

Code: A-022-3D-C1
54. A path perpendicular to the edge of the tape along which information may be stored by the presence or absense of holes is called a:
A. row.
B. column.
C. line.
D. block.
ANSWER: A

Code: A-022-3A-C1
55. A means of identifing information or a location on a CNC tape is as the:
A. cycle.
B. format.
C. byte.
D. address.
ANSWER: D

Code: A-022-3-C1
56. Match tape format terms with format definitions.

Tape Format Terms	Tape Format Definitions
1. Address	a. A symbol indicating the significance of the information immediately following.
2. Channels	b. A number which identifies 2 locations in memory.
3. Characters	c. A word or group of words, considered as units and provide sufficient information for an operation.
4. Row	d. Paths parallel to the edge of the tape along which information may be stored.
5. Bit	e. A binary digit represented by the presence or absence of a hole on the tape.
6. Block	f. The coded representation of symbols such as letters, numerals and punctuation marks on the tape.
	g. A mistake or malfunction.
	h. A path perpendicular to the edge of the tape along which information may be stored.

ANSWERS: 1-a, 2-d, 3-f, 4-h, 5-e, 6-c

Code: A-022-3-C1
57. Match tape terminology with tape definitions.

Tape Terminology	Tape Definitions
1. Tape	a. The trailing end portion of tape.
2. Tape lagger	b. A nonprinting spacing action on tape preparation equipment.
3. Tape format	c. A device used to sense bits of information on punched tape.
4. BCD format	d. A magnetic or perforated paper medium for storing information.
5. Binary code	e. The general order in which information appear on the input media.
6. Tab	f. A format in which the numbers and characters appear in successive blocks.
	g. A system for describing numbers using only two digits which are expressed as either 1 or 0, true or false on or off.
	h. A system of representing numbers comprised of a combination of four binary bits running across the tape.

ANSWERS: 1-d, 2-a, 3-e, 4-h, 5-g, 6-b

Objective # 23
Task: Select canned cycles.

Code: A-023-1-C1
58. What is a canned cycle?
A. A preset series of operations which direct machine tool movement to complete an action.
B. A standardized routine which may be called up repeatedly.
C. A group of commands.
D. A single command that calls a group of commands.
ANSWER: A

Code: A-023-2-C1
59. What is the most common canned cycle used when drilling holes?
A. G81
B. G82
C. G83
D. G84
ANSWER: C
Note: Code may vary with different machines.

Code: A-023-3-C1
60. A preset sequence of events initiated by a single command (for example G 84 will perform a tap cycle) is called what type of cycle?
A. block
B. canned
C. dwell
D. index
ANSWER: B

Objective # 24
Task: Program restart points.

Code: A-024-2-C1
61. A block within a CNC program identified by an "O" or "H" in place of the word address "N" and containing sufficient data to enable resumption of the program following an interuption is known as the:
A. scanner block.
B. repeat block.
C. reference block.
D. transfer block.
ANSWER: C

Code: A-024-1-C1
62. The main purpose of programmed restart points are to:
A. allow the operator to take a break.
B. provide the programmer with more work.
C. Provides a reference point from which all axis and related command information has been reset.
D. to cover up operators/programmers errors.
ANSWER: C

Objective # 25
Task: Write manual program.

Code: A-025-13-C1
63. What is the purpose of using line numbers in a program?
A. The CNC controller always requires them.
B. Maintains an order for the operator to identify a certain line of information and the controller uses them to search for specific locations anywhere on the tape or memory.
C. Tells the programmer what line number he is on, when writing the program manually.
D. The tape making device needs a line numbering system so it can keep track of each line of information internally.
ANSWER: B

Code: A-025-12-C1
64. Manual programs may have up to "G" codes per line:
A. 1
B. 5
C. 6
D. 12
ANSWER: B

Code: A-025-11-C1
65. Match programming codes with programming code definitions.

Programming Codes	Programming Code Definition
1. M-code	a. A coding system defining miscellaneous functions.
2. T-code	b. A coding system where the characters are letters A through Z and numbers 1-9.
3. G-code	c. A data transmission code in which seven bits are used to represent each code chacter.
4. ASCII code	d. A coding system in which codes remain operational until the code itself is changed.
5. Binary code	e. A coding system that identifies the tool needed.
6. Modal code	f. A coding system used to identify separate words or groups of characters in a tab sequential format.
7. Nonmodal code	g. A coding system in which general functions are defined.
8. Tab code	h. A coding system in which the codes are effective only in the specific programmed block.
9. Alphanumeric	i. A coded number system having two as its base and expressing all quanities by the numeral 1 and 0.
	j. A coding system defining preparatory or cycle types.

ANSWERS: 1-a, 2-e, 3-j, 4-c, 5-i, 6-d, 7-h, 8-f, 9-b

Objective # 26
Task: Program with purchased software.

Code: A-026-6-C1
66. Prepartory functions are:
A. used only in metric work.
B. sometimes called "G" codes.
C. used only in inches.
D. do not apply in the absolute mode.
ANSWER: B

Code: A-026-4-C1
67. Match the CNC lathe address with definitions.

CNC lathe address prefix		Definitions
1.	N	a. Designates cross travel axis.
2.	G	b. Arc offset parallel to X axis.
3.	X	c. Feedrate in kilos.
4.	Z	d. Refers to spindle travel.
5.	I	e. Preparatory code.
6.	K	f. Arc axis parallel to Z axis.
		g. Designates longitudinal axis.
		h. Block or line number.

ANSWERS: 1-h, 2-e, 3-a, 4-g, 5-b, 6-f.

Code: A-026-9-C1
68. Match the "G" code with the command.

G code		Command
1.	G00	a. Linear interpolation.
2.	G91	b. Absolute mode.
3.	G92	c. Position move.
4.	G70	d. Inch dimension.
5.	G90	e. Dwell in seconds.
6.	G01	f. Incremental mode.
		g. Clockwise interpolation.
		h. Position preset, starting position.

ANSWERS: 1-c, 2-f, 3-h, 4-d, 5-b, 6-a.
Note: G-code can be machine specific and may vary for different machines.

Code: A-026-3-C1
69. A preset sequence of events initiated by a single command. For example G84 will perform a tap cycle without additional programming by the programmer is called a:
A. flip-flop.
B. jump.
C. canned cycle.
D. subroutine.
ANSWER: D
Note: May vary with different machines.

Objective # 27
Task: Design special fixtures for custom job.

Code: A-027-2-C1
70. Special fixtures should be designed to reduce part:
A. set-up time.
B. take-down time.
C. inventory.
D. programming.
ANSWER: A

Code: A-027-4-C1
71. Which CNC machine part does not need to be considered when designing a fixture:
A. clamps.
B. toolholders.
C. machine table.
D. control panel.
ANSWER: D

Code: A-027-4-A1
72. The most important consideration when designing a fixture is the:
A. workpiece orientation.
B. operator's safety.
C. tool location.
D. type of clamps.
ANSWER: B

Code: A-027-2E-C1
73. Designing a fixture so that there is only one way to load and orientate the part is called:
A. planning.
B. fool proofing.
C. scanning.
D. referencing.
ANSWER: B

Objective # 28
Task: Design clamps and holders for custom job.
Code: A-028-2D-C1
74. Clamps should always be placed as close to what location as possible:
A. tool.
B. support.
C. x-axis.
D. setpoint.
ANSWER: B

Code: A-028-2-C1
75. Improper clamp/holder design can result in:
A. part accuracy.
B. decreased costs.
C. minimal modification
D. part distortion.
ANSWER: D

Code: A-028-5-C1
76. The accuracy of all parts requiring special fixtures depends on the:
A. programming.
B. processing.
C. work holding device.
D. workpiece size.
ANSWER: C

Objective # 29
Task: Write manual complex contouring program.

Code: A-029-7-C1
77. A system which generates a continuously controlled tool path by interpolation of intermediate points or coordinates is called:
A. straight-cut.
B. point-to-point.
C. contouring.
D. closed loop.
ANSWER: C

Code: A-029-7-C1
78. A function of a control whereby data points are generated between given coordinate position to allow simultaneous movement of two or more axes of motion in a defined geometric pattern is called:
A. interpolation.
B. heuristic.
C. feedback.
D. data processing.
ANSWER: A

Code: A-029-7B-C1
79. A mode of contouring control which uses the information contained in a single block to produce an arc of a circle is called:
A. parabolic.
B. helical.
C. circular.
D. linear.
ANSWER: C

Code: A-029-9-C1
80. The major advantage to using circular interpolation vs linear interpolation is:
A. longer tape lengths.
B. shorter tape lengths.
C. varing rate of travel.
D. tool starting positions.
ANSWER: B

Objective # 30
Task: Enter tool offset.

Code: A-030-2-C1
81. The ability to reset tool position manually to compensate for tool wear, finish cuts and tool usage is called tool:
A. function.
B. overshoot.
C. length.
D. offset.
Answer: D

Code: A-030-4-C1

82. The main advantage of tool offset when programming for a multiple part machining process is that the programmer does <u>not</u> need to know the exact:

A. type of tool.
B. length or diameter of tool.
C. zero point of machine.
D. function of tool.

ANSWER: B

Code: A-030-3-C1

83. Match the milling G-codes with its tool offset function.

Milling G-code	Tool offset function
1. G40	a. Tool offset double increase.
2. G41	b. Automatic tool compensation.
3. G42	c. Tool offset decrease.
4. G43	d. Tool length compensation cancel.
5. G44	e. Tool length compensation + direction.
6. G45	f. Cutter diameter compensation left.
7. G46	g. Tool nose radius compensation right.
8. G47	h. Cutter diameter compensation cancel.
9. G48	i. Tool offset double decrease.
10. G49	j. Cutter diameter compensation right.
	k. Tool length compensation - direction.
	l. Tool offset increase.

ANSWERS: 1-h, 2-f, 3-j, 4-e, 5-k, 6-l, 7-c, 8-a, 9-i, 10-d.

Note: G-codes can be machine specific and may vary for different machines

Objective # 31

Task: Enter tool length compensation.

Code: A-031-6-C1

84. A manual input means which eliminates the need for pre-set tooling and allows the programmer to program all tools as if they are of equal length is called:

A. variable block compensation.
B. tool length compensation.
C. tool diameter compensation.
D. tool coordination compensation.

ANSWER: B

Code: A-031-7-C1
85. The main purpose of the tool assembly drawing is to:
A. describes the cutting tool and its setting length.
B. determines tool production.
C. identifies tool manufacturer.
D. establishes the data the tool was purchased.
ANSWER: A

Objective # 32
Task: Repair broken tape.

Code: A-032-1-C1
86. The standard CNC tape width is:
A. .50"
B. 1.0"
C. 1.5"
D. 2.0"
ANSWER: B

Code: A-032-1-C1
87. When a CNC tape breaks the operator should:
A. trim ragged torn edges straight align holes and apply tape patch.
B. throw the tape away and make a new tape.
C. place torn edges of tape together, align holes and apply tape patch.
D. call the programmer and have them fix the tape.
ANSWER: C

Note: Some tape readers will not except a spliced tape.

Code: A-032-1-C1
88. CNC machine uses what type of tape as a medium for storing information:
A. magnetic tapes.
B. punched tape.
C. floppy disk tape.
D. magnetic and punched tape.
ANSWER: D

Code: A-032-5-C1
89. When repairing a CNC tape, the operator should:
A. cover the holes with a tape patch.
B. place tape patch on both sides of torn tape leaving holes exposed.
C. place a tape patch on the front of the tape only.
D. place a tape patch on the back of the tape only.
ANSWER: B

Objective # 33
Task: Update programs from engineering changes.

Code: A-033-5-C1
90. When revising a program from engineering changes the programmer should always:
A. verify revision authorization.
B. make changes without question.
C. write a new program.
D. throw away the old program.
ANSWER: A

Code: A-033-2-C1
91. A term which means to modify the form or format of data.
A. Address.
B. Truncate.
C. Interpolate.
D. Edit.
ANSWER: D

Objective # 34
Task: Determine job priorities.

Code: A-034-1-C1
92. When developing a job priority list, which of the following is <u>not</u> a consideration?
A. Materials needed.
B. Machining process.
C. Job completion date.
D. Monetary value.
ANSWER: D

Code: A-034-6-C1
93. The ultimate goal of a job priority list is to:
A. employ a minimum number of workers.
B. make a profit for the company.
C. maintain an uninterupted work flow.
D. keep the management happy.
ANSWER: C

Objective # 35
Task: Schedule programs.

Code: A-035-1-C1
94. The main consideration when scheduling programs should be the program:
A. size.
B. language.
C. availability.
D. cost.
ANSWER: C

Code: A-035-4-C1
95. When scheduling programs, a list of available programs should be compared to a list of:
A. job priorities.
B. materials available.
C. machining processes.
D. tools and tool holders.
ANSWER: A

Objective # 36
Task: Schedule heat-treated materials.

Code: A-036-2-C1
96. Which is not a major consideration for scheduling heat-treated materials:
A. type of treatment.
B. type of material.
C. prior machining.
D. cost of treatment.
ANSWER: D

Code: A-036-4-C1
97. The purpose for heat treating materials is to:
A. increase material hardness.
B. change the material properties.
C. conserve on materials used.
D. increase final cost of part.
ANSWER: B

Objective # 37
Task: Schedule secondary processes

Code: A-037-1A-C1
98. Which of the following is considered a secondary process?
A. Milling.
B. Turning.
C. Grinding.
D. Drilling.
ANSWER: C

Code: A-037-3-C1
99. Which of the following secondary operations would be performed first?
A. Cleaning.
B. Grinding.
C. Fitting.
D. Bluing.
ANSWER: B

Objective # 38
Task: Schedule plating.

Code: A-038-1-C1
100. The process called plating means to:
A. adhere the part surface with a thin coating of metal.
B. make a part mold.
C. cover the part with a thin coat of plastic.
D. polish part surface.
ANSWER: A

Code: A-038-2-C1
101. Which would not be a major consideration for a plating priority list?
A. Due date of final plated product.
B. In-house or sub-contract plating.
C. Paper work for plating.
D. Prior machining processes.
ANSWER: C

Objective # 39
Task: Check tooling sheet.

Code: B-001-2-C1
102. Tools must be listed in order of their use because:
A. the turret can only advance one position for each use.
B. the incorrect listing will cause the tool to possibly strike the work during position move.
C. the turret can only move to the positions programmed.
D. each tool can only be used once in a program.
ANSWER: C

Code: B-001-1-C1
103. A form which lists part information and tool information needed for CNC machine set-up is called a:
A. tool assembly drawing.
B. part program.
C. manuscript.
D. tooling sheet.
ANSWER: D

Code: B-001-3B-C1
104. If one tool is missing when setting up the tools for multiple tool usage, you should:
A. omit the step that involves that tool.
B. substitute a similar tool.
C. cancel the operation and return the program to the programmer.
D. report the missing tool information to the programmer or specified personnel.
ANSWER: D

Code: B-001-3A-C1
105. The use of tool identification number is important because:
A. eliminates the use of incorrect tools.
B. aids in a more rapid selection of tools.
C. prevents the selection of incorrect workpieces.
D. is not important because students do not need to know shapes of various cutters.
ANSWER: B

Objective # 40
Task: Transport tools.

Code: B-002-1-C1
106. When transporting tools from the storage area to work area:
A. a tool carrier is only needed for 5 or more tools.
B. a tool carrier is not required for roughing tools.
C. each tool should be examined and placed in the tool carrier to protect the cutting edge.
D. a tool carrier is required for finish cut tools only.
ANSWER: C

Code: B-002-3-C1
107. Which of the following is <u>not</u> a sound tooling practice
A. check all tools before they are used.
B. clean and sharpen tools before using.
C. always choose the longest tool length.
D. despose of damaged or defective tools.
ANSWER: C

Code: B-002-2-C1
108. A form which provides tool identification information, a picture of the tool and tool dimensions for a particular tool is called a tool:
A. blueprint.
B. graphic depiction.
C. program list.
D. assembly drawing.
ANSWER: D

Objective # 41
Task: Install cutting tools in holder.

Code: B-003-2-C1
109. The main purpose of a tool holder is to:
A. Provide added length to the tool.
B. Hold the tool securely while tool is being transported.
C. Hold the tool securely in the machine spindle.
D. Position tool for sharpening.
ANSWER: C

Code: B-003-3-C1
110. When cutting tools are placed into tool holders adjustments can be made to:
A. keep cut within the program tolerance.
B. compensate for operator error.
C. align the cutting edge to proper position.
D. position starting point.
ANSWER: A

Objective # 42
Task: Load tools in tool drum (also called turret or magazine).

Code: B-004-4-C1
111. T01 in a CNC program means the tool is in the:
A. straight line cutting mode.
B. number one postion in the turret.
C. THREAD cutting tool.
D. final finish cutting position.
ANSWER: B

Code: B-004-2-C1
112. If while loading a tool drum/turret, you notice a dull tool; your next step is to:
A. reduce feedrate.
B. increase the spindle speed.
C. increase spindle speed and reduce the feedrate if the tool is not chipped.
D. return the tool for replacement.
ANSWER: D

Code: B-004-3-C1
113. A device on machining centers and tool changers which has holes around the perimeter of a circle, or on a chain, spaced at a specific distance and contains two or more coded stations is called a tool:
A. workstation.
B. drum.
C. transfer arm.
D. turning center.
ANSWER: B

Code: B-004-5-C1
114. Another name for a tool drum is a tool:
A. turret/magazine.
B. track/sector.
C. reference/resolver.
D. programmer/feeder.
ANSWER: A

Objective # 43
Task: Mount holder and tool on spindle (manually).

Code: B-005-A2-C1
115. When mounting the tool in a CNC machine without an automatic draw bar, select the tool, place it in the holder and:
A. rotate the tool holder in the spindle and tighten.
B. rotate the tool holder in the spindle to check for consequent offset.
C. check the spindle for chips before inserting the tool holder in the spindle.
D. align the spindle before inserting the tool holder.
ANSWER: C

Code: B-005-B1-C1
116. How do you clean the spindle?
A. Use compressed air to blow spindle free of chips.
B. Clean the spindle with the chip remover.
C. Rotate the spindle at a high RPM to sling out chips.
D. Run the spindle on reverse to remove the chips.
ANSWER: B

Objective # 44
Task: Load automatic tool changer.

Code: B-006-2-C1
117. When loading the automatic tool changer:
A. all pockets must be filled.
B. pockets appear in the reverse order to program (changer runs in reverse).
C. the tool changer will select the position as programmed by the "T" code number.
D. the tool changer will select the position as programmed by "M" code or number.
ANSWER: C

Code: B-006-4-C1
118. When loading an automatic tool changer:
A. the tools will appear in the order of use in the problem.
B. the tools will be in the order of size.
C. a tool changer can be started from any position.
D. duplicate tools must be used as the tool changer will not skip the select.
ANSWER: A

Code: B-006-4A-C1
119. When loading the automatic tool changer tools are loaded:
A. as specified by programmers set.
B. in sequence by length.
C. in any sequence.
D. when the machine is in cycle.
ANSWER: A

Code: B-006-6-C1
120. Tools are removed from the tool drum and placed in the interchange arm and then returned to the tool drum by the:
A. intermediate station arm.
B. interchange station arm.
C. intermediate transfer arm.
D. interchange transfer arm.
ANSWER: C

Objective #45
Task: Operate drawbar (manually automatically).

Code: B-007-A5-C1
121. The drawbar head is tightened manually using the:
A. operator's hand.
B. drawbar wrench.
C. drawbar jog mode.
D. drawbar automatic tightened button.
ANSWER: B

Code: B-007-A1-C1
122. The first step to operating a automatic drawbar is to:
A. engage selector switch.
B. align keyways in tool holder or adapter with keyways in the spindle hose.
C. place a new tool holder in the spindle nose.
D. clean holder and pocket of chips, dirt and other foreign materials.
ANSWER: D

Objective #46
Task: Dial cutter compensation.

Code: B-008-4-C1
123. A feature on a CNC unit which provides the capability to use a cutter of a different diameter than originally programmed is called:
A. cutter depth compensation.
B. control diameter compensation.
C. cutter diameter control.
D. cutter diameter compensation.
ANSWER: D

Code: B-008-1-C1
124. A positive cutter diameter compensation value inputed at the keyboard input panel would indicate an:
A. oversized cutter.
B. undersized cutter.
C. rapid cutter.
D. slow cutter.
ANSWER: A

Code: B-008-2-C1
125. An inputed CDC value becomes active when the:
A. CDC value is entered.
B. tool is loaded in spindle.
C. operator pushes CDC activate button.
D. tool is loaded in turret.
ANSWER: B

Code: B-008-1-C1
126. When compensating for a different sized cutter, the difference between the programmed diameter and the actual diameter can range from _____to _____inch.
A. -0.5000, +0.5000
B. -1.0000, +1.0000
C. -1.5000, +1.5000
D. -2.0000, +2.0000
ANSWER: B

Code: B-008-3-C1
127. The cutter diameter compensation value can be inputed to the control in increments of _____inch using the keyboard input panel.
A. 0.1
B. 0.01
C. 0.001
D. 0.0001
ANSWER: D

Code: B-008-2-C2
128. If the program calls for a 1.000 inch diameter cut and the diameter of the actual cutter being used is 0.9500 inch, then the CDC value inputed by the operator would be:
A. -.0050
B. +.0050
C. +.0500
D. -.0500
ANSWER: D

Objective #47
Task: Mount workpiece
Code: B-009-2-C1
129. A workpiece mounting fixture should be designed to reduce part:
A. set-up time.
B. machining operations.
C. finishing operations.
D. transfer time.
ANSWER: A

Code: B-009-4-C1
130. Distortion of the workpiece can occur if mounting clamps are:
A. placed to close to support locations.
B. placed directly over support locations.
C. placed to far away from support locations.
D. placed vertical to support locations.
ANSWER: C

Code: B-009-1-C1
131. When preparing to mount the workpiece in the fixture the operator should first:
A. test run the machine.
B. clamp scrape workpiece in fixture.
C. clean chips from worktable and fixture.
D. mount fixture to back of worktable.
ANSWER: C

Objective #48
Task: Set zero.

Code: B-010-3-C1
132. The capability to shift the zero location of the workpiece to any reasonable location on the machine table is called zero:
A. positioning.
B. offset.
C. verifier.
D. format.
ANSWER: B

Code: B-010-2-C1
133. Another name for a permanent starting point on a CNC machine table is:
A. fixed zero.
B. constant zero.
C. set zero.
D. floating zero.
ANSWER: A

Code: B-010-3-C1
134. A CNC machine which has no fixed reference point (zero point) and allows the zero point to be set at any convenient location on the machine table is said to have a:
A. fixed zero.
B. full floating zero.
C. full fixed zero.
D. floating zero.
ANSWER: B

Objective #49
Task: Dry run program.

Code: B-011-B2-C1
135. To dry run the CNC machine tool, you should:
A. operate the program in the "TOO" (tool open) mode.
B. operate the program with the tool turret in the "off" position.
C. isolate the machine and operate the program.
D. Program a G-code.
ANSWER: C

Code: B-011-C2-C1
136. To dry run a EDM, you should:
A. set the wire guides so the wire will not touch workpiece.
B. remove wire and adjust the guides to clear workpiece and clamps.
C. turn off the wire feed and run normally.
D. remove the drawing pen from the holder arm and run the program.
ANSWER: B

Code: B-011-A2-C1
137. A dry run for the CNC lathe can be accomplished before a cut by:
A. isolating the machine and observe graphics.
B. removing the feedrates for rapid move.
C. isolating the turret/drum.
D. dry run cannot be accomplished before the cut.
ANSWER: A

Code: B-011-B2-C1
138. To dry run the CNC vertical mill, you should:
A. avoid tool clearance.
B. isolate the machine, and program can be monitored by the graphic display.
C. set the tool clearance and watch for malfunctioning.
D. remove the feedrates for rapid travel.
ANSWER: C

Code: B-011-3-C1
139. While utilizing coolant modes:
A. the manual coolant override may be used if necessary.
B. only one rate can be used throughout the entire program.
C. the coolant code cannot be changed during the program.
D. the coolant must be used for all operations.
ANSWER: A

Code: B-011-7-C1
140. In what manner do you dry run a CNC vertical mill?
A. Operate it with the turret and tools removed.
B. Operate it with the feed removed for a faster run time.
C. Change the cutter depth so that it does not touch the workpiece.
D. Run like normal but without coolant.
ANSWER: C

Objective # 50
Task: Add coolant commands.
Code: B-012-1B-1C
141. In which of the functions listed below are the coolant commands generally programmed?
A. The preparatory function.
B. The tool code function.
C. They need not be programmed because they are automatic.
D. The miscellaneous function.
ANSWER: D

Code: B-012-1A-C1
142. To active a coolant mode in a CNC operation, you should:
A. do nothing because the coolant runs at the same rate throughout the entire proram.
B. select the edit mode and insert the coolant mode by use of the "M" code.
C. select the edit mode and insert the coolant mode by use of the "G" code.
D. select the edit mode and insert the coolant mode by use of the "C" code.
ANSWER: B

Code: B-012-1B-C1
143. The purpose of using a coolant at a CNC machine is to:
A. maintain sharpness of cutting tool.
B. reduce heat and chip buildup.
C. to soften the metal being cut.
D. wash away chips from workpiece.
ANSWER: B

Code: B-012-1B-C1
144. Two basic methods of coolants application are:
A. mist and trickle.
B. flood and mist.
C. drip and trickle.
D. drip and flood.
ANSWER: B

Objective # 51
Task: Alter speed/feed commands.

Code: B-013-2-C1
145. The axis feedrate for most turning centers is controlled by a four digit number preceded by the letter:
A. G.
B. T.
C. S.
D. F.
ANSWER: D

Code: B-013-2-C1
146. The spindle may be stopped by using what code?
A. "G"
B. "M"
C. "F"
D. "D"
ANSWER: B

Code: B-013-1-C1
147. The CNC feedrate remains the same:
A. on all cutting operations.
B. until a program line change is entered for the feedrate.
C. cannot be changed until the program is complete.
D. unless it is changed by the "M" code.
ANSWER: B

Code: B-013-2-C1
148. Spindle speeds are normally programmed on a CNC turning center by digit number preceeded by the letter:
A. G.
B. M.
C. F.
D. S.
ANSWER: D

Objective # 52
Task: Update programs stored in bubble memory.

Code: B-014-1-C1
149. A place for storing information in a control system or computer for planned use is called what type of storage:
A. encoded.
B. general.
C. buffer.
D. active.
ANSWER: C

Code: B-014-3-C1
150. Data storage locations which holds the data currently being processed is called what type of storage:
A. general.
B. encoded.
C. buffer.
D. active.
ANSWER: D

Code: B-014-1-C1
151. A CNC machine which is said to have 32K of memory can handle appoximately how many words in internal storage.
A. 320.
B. 3,200.
C. 32,000.
D. 320,000.
ANSWER: C

Objective # 53
Task: Complete machine tool safety setup.

Code: B-015-3-C1
152. Before measuring the workpiece the operator should make sure that the:
A. spindle and slides have stopped moving.
B. master switch is locked in the "on" position.
C. guards, shields, barriers and covers have been removed.
D. chips and grit have been brushed aside by hand.
ANSWER: A

Code: B-015-S-C1
153. Metal chips and grit accumulations are best removed from the machine by using a:
A. bare hand.
B. gloved hand.
C. brush or rake.
D. direct stream of air.
ANSWER: C

Code: B-015-1-C1
154. Which of the following is <u>not</u> a function of safety guards, shields, barriers and covers?
A. Cover moving parts.
B. Protect operator from injury.
C. Prevent unsafe working conditions.
D. Avoid OSHA fines and penalties.
ANSWER: D

Code: B-015-1-C1
155. Match the safety hazard with the safety equipment.

Safety Hazard	Safety Equipment
1. Exposed moving parts	a. Safety zones.
2. Oil or grease	b. Safety glasses.
3. Build-up of chips and grit	c. Guards, shields, barries covers, ect.
4. Flying metal chips	d. Chip rake or brush.
5. Objects falling on floor	e. Safety shoes.
6. Sharp edges	f. Gloves.
	g. Degreasing agent.
	h. Ear plugs.

ANSWERS: 1-c, 2-g, 3-d, 4-b, 5-e, 6-f

Objective # 54
Task: Verify workpiece detail identification number.

Code: B-016-2-C1
156. The purpose of the workpiece detail identification number is to provide a means of cross referencing to the
A. program.
B. programmer.
C. blueprint.
D. operator.
ANSWER: C

Objective # 55
Task: Verify type of material of workpiece.

Code: B-017-2-C1
157. Which of the following is not a material commonly used in CNC machining process?
A. Brass.
B. Steel.
C. Aluminum.
D. Glass.
ANSWER: D

Objective # 56
Task: Establish tolerance requirment.

Code: B-018-3-C1
158. Which of the following is not a common measuring tool for establishing if tolerance requirements were met?
A. Profilometer.
B. Dial indicator.
C. Metric/inch ruler.
D. Micrometer.
ANSWER: B

Code: B-018-3B-C1
159. A measuring device used to measure surface characteristics in microinches is called:
A. micrometer.
B. divider.
C. edge locator.
D. profilometer.
ANSWER: D

Code: B-018-2-C1
160. A correction for tool position parrallel to a controlled axis is called tool:
A. offset.
B. functions.
C. transfer.
D. verify.
ANSWER: A

Objective # 57
Task: Thread electrical discharge machine (EDM).

Code: B-019-1-C1
161. When preparing to thread a electrical discharge machine the first stop for the operator is to:
A. check for malfunctions.
B. feed wire through the rollers and guides.
C. verify size of wire with set-up sheet.
D. verify wire guides are correct size.
ANSWER: C

Code: B-019-2-C1
162. When identifying types of CNC machines EDM stands for:
A. Edge Dimensioning Machine.
B. Emulator Documentation Machine.
C. Electrical Digital Machine.
D. Electrical Discharge Machine.
ANSWER: D

Objective # 58
Task: Turn on power.
Code: C-001-1-C1
163. Where is the point of origin?
A. The starting position of the program.
B. The edge of the vise.
C. In the middle of the work piece.
D. Where the X, Y, and Z axis are zero.
ANSWER: D

Code: C-001-1-C1
164. What is the function of the main machine disconnect switch?
A. Shuts off all power to the machine tool.
B. Stops the quill.
C. Is only connected to the motors.
D. Powers only the on board computer.
ANSWER: A

Code: C-001-3-C1
165. How can the operator jog the machine table in the "X" direction?
A. Set the MDI axis switch to the X axis and activate the jog switch.
B. Press the jog switch.
C. Turn the handwheel on the end of the table.
D. Press the start switch.
ANSWER: A

Objective #59
Task: Call up program in distributed numerical control.

Code: C-002-2-C1
166. The keypad of the machine tool:
A. accepts only numbers.
B. is an input device for alpha numerical information.
C. is used to move each axis.
D. displays only machine status information.
ANSWER: A

Code: C-002-3-C1
167. DNC is the acronym for:
A. Dedicated Numerical Control.
B. Digital Number Code.
C. Direct Numeric Code.
D. Direct Numerical Control.
ANSWER: D

Code: C-002-5-C1
168. The CNC system computer:
A. is capable of processing input information for any CNC machine tool.
B. controls the functions and positioning for the specific machine attached to the computer.
C. requires a host computer to operate.
D. is placed remote to the machine tool.
ANSWER: B

Code: C-002-8-C1
169. The host computer:
A. stores program information and location information in a specific coded file.
B. is the CNC on board computer.
C. controls the machine tool movement.
D. is usually programmed from the MDI panel.
ANSWER: C

Objective # 60
Task: Place tape in reader.

Code: C-003-1-C1
170. The first thing done to assure correct loading of the CNC punched tape is to :
A. set controller to load mode.
B. set controller to run mode.
C. enter the first block of the program.
D. clear the active memory.
ANSWER: D

Code: C-003-3-C1
171. The tape leader:
A. is used to align tape before reading program information.
B. contains program information vital to the execution of the program.
C. is blank and can be left off the tape.
D. is usually positioned at the end of the tape.
ANSWER: A

Code: C-003-6-C1
172. Match the CNC Tape Specifications with the CNC Tape Measurements.

CNC Tape Specifications	CNC Tape Measurements.
1. Tape width	a. .392 $\pm$ .003
2. Diameter of sprocket/ feed hole	b. $\pm$ 0.009
3. Spacing of all hole centerlines	c. 1.000 $\pm$ .003
4. Spacing from tape edge to sprocket holes	d. .100 $\pm$ .002
5. Cummulative error in 6 inches	e. .046 + .002 - .001
	f. .072 + .001 - .002
	g. .004 $\pm$ .0003

ANSWERS: 1-c, 2-e, 3-d, 4-a, 5-b.

Code: C-003-1-C1
173. Match the CNC Tape Terms with the Definitions.

CNC Punched tape terms	Definition
1. Parity bit	a. Channel or track 5 on a CNC tape (checks punching accuracy).
2. Tape leader	b. Portion of tape which contains only the sprocket holes after tape coding.
3. EOB code	c. Inexpensive material used for CNC tape easily effected by oil and water.
4. Paper tape	d. Metallized material used for high production CNC tapes.

173. (cont.)

5. Mylar tape	e. Codes punched in CNC tapes to provide ease in reading.
6. Foil tape	f. Character which indicates the end of block information.
	g. Plastic coated material used for CNC tape.
	h. Portion of tape which contains only the sprocket holes before tape coding.

ANSWERS: 1-a, 2-h, 3-f, 4-c, 5-g, 6-d

Code: C-003-4-C1
174. The tape reader:
A. does not require that the tape be aligned between the guide rollers.
B. requires the operator to align the tape between the guide rollers.
C. is a control switch located on the MDI panal.
D. can also punch program data onto a blank CNC tape.
ANSWER: B

Objective # 61
Task: Key in program on machine.

Code: C-004-A5-C1
175. Editing takes place:
A. prior to writing a user program.
B. after the part has been cut.
C. during the machining cycle.
D. after the user program is written prior to cutting the part.
ANSWER: D

Code: C-004-A7-C1
176. Mass storage for programs:
A. takes place in the controllers active memory.
B. records all tooling information.
C. is paper tape or magnetic tape used to store user programs.
D. is limited to 1024 characters.
ANSWER: C

Code: C-004-A3-C1
177. The G code is:
A. a preparatory function used to set machine mode or operation.
B. a feed rate from a host computer.
C. an address location of a geographic point on the part.
D. starts the spindle rotating.
ANSWER: A

Code: C-004-A4-C1
178. Feed rate is:
A. given in surface feet per minute.
B. revolutions per minute of the spindle.
C. cutting speed.
D. given in inches per minute.
ANSWER: D

Code: C-004-A4-C1
179. An orthographic projection shows:
A. a pictoral representation of the past.
B. an exploded view of the part assembly.
C. how the part fits into the work holding device.
D. three views of the part.
ANSWER: D

Objective # 62
Task: Align holding device with machine axis.

Code: C-005-6-C1
180. When the dial indicator needle moves and the work holding device is moved, the length of the device indicates that the:
A. indicator is broken.
B. work holding device is one inch out of alignment.
C. work holding device is in alignment.
D. quill has been retracted.
ANSWER: C

Code: C-005-7-C1
181. Adjust the work holding device to alignment by:
A. striking with a large hammer.
B. prying with a steel bar.
C. tapping with a soft hammer or hand.
D. turning the lead screw.
ANSWER: C

Code: C-005-9-C1
182. After checking the work holding device with a dial indicator, if the needle moves the device should be adjusted to:
A. half of the movement of the dial indicator needle.
B. full movement of dial indicator needle.
C. not adjusted if the needle moves.
D. increments of .050 inches.
ANSWER: A

Code: C-005-3-C1
183. The purpose of clawing the bottom of the work holding device is to
A. maintain neatness in the shop area.
B. prevent scratching the device.
C. remove oil that might discolor the work.
D. assure the device will be mounted flat on the machine's table.
ANSWER: D

Objective # 63
Task: Clamp dial indicator to tool holder.

Code: C-006-1-C1
184. The dial indicator:
A. is a instrument with an anvil and thimble.
B. is used for comparison measurement and set up
C. only reads parts when in a vertical position.
D. has a vernier scale.
ANSWER: B

Code: C-006-2-C1
185. The mounting device for a dial indicator can be a:
A. 12 inch C-clamp.
B. bolt and nut.
C. micrometer.
D. magnetic base.
ANSWER: D

Objective # 64
Task: Change tool holder.

Code: C-007-A3-C1
186. The wrench used to loosen the machine's lock collar is called a:
A. box.
B. socket.
C. open end.
D. spanner.
ANSWER: D.

Code: C-007-A1-C1
187. The spindle break can be applied when the:
A. machine is cutting a part.
B. machine is idle.
C. quill is retaining.
D. spindle is changing speed.
ANSWER: B

Code: C-007-5-C1
188. The tool holder:
A. can be any taper or used on any machine tool.
B. is one size only.
C. does not need cleaning or inspected.
D. is a specific size and taper and has to be matched to the machine tool and cutting tool.
ANSWER: D

Objective # 65
Task: Change cutting tool.

Code: C-008-A1-C1
189. Solid cutting tools are made of:
A. cold rolled steel.
B. high speed steel.
C. brass.
D. hot rolled steel.
ANSWER: B

Code: C-008-A4-C1
190. Carbide inserts used for cutting are:
A. harder than high speed steel but brittle.
B. softer than high speed steel.
C. always triangular.
D. all standard size.
ANSWER: A

Code: C-008-B4-C1
191. Four flute end mills can be used for the following operations except:
A. pocket milling.
B. face milling.
C. surface milling.
D. drilling.
ANSWER: D

Objective # 66
Task: Adjust tool offset manually.

Code: C-009-2-C1
192. A one inch micrometer gives direct measurement in:
A. inches.
B. feet.
C. millimeters.
D. thousands of an inch.
ANSWER: D

Code: C-009-4-C1
193. The tool length offset value is the distance from the:
A. quill to the knee.
B. tip of the tool with the spindle in home position to the Z zero plane.
C. tip of the tool to the bottom of the work.
D. tip of the tool to the taper reader.
ANSWER: B

Code: C-009-5-C1
194. TLO is the abbreviation for:
A. tool length offset.
B. taper left on part.
C. timed logic on.
D. too large outside diameter.
ANSWER: A

Objective # 67
Task: Interpret operator related messages on screen.

Code: C-010-1-C1
195. If the operation of the machine is in set-up, which of the following messages would be displayed on the screen?
A. Cycle hold
B. Tool 18
C. X 2.128 Y 3.972
D. Single block
ANSWER: C

Code: C-010-2-C1
196. When a milling machine is in operation and the screen displays a "G84" message, the operation is called:
A. drilling.
B. dwell.
C. rough-bore.
D. tapping.
ANSWER: D

Code: C-010-2-C1
197. When an operator performs an adjustment to the coolant system during a cut, the following message would be displayed on the screen:
A. M00
B. M02
C. G81
D. G90
ANSWER: A

Code: C-010-2-C1
198. When the optional stop selector switch is powered, which of the messages listed below could activate it?
A. M00
B. MO1
C. M06
D. M02
ANSWER: B

Code: C-010-3-C1
199. The message "T2", "TLO 3.100" indicates:
A. a broken tool.
B. an absolute position.
C. an incremental position.
D. a tool change.
ANSWER: D

Code: C-010-3-C1
200. When the display "138% V", what action should be taken?
A. Increase the feed rate.
B. Decrease the feed rate.
C. Run a diagnostic tape.
D. Shut down the machine.
ANSWER: B

Objective # 68
Task: Control spindle speed override.

Code: C-011-1-C1
201. The increase/decrease spindle speed feature on the control panel is known as a(n):
A. infinitely-Adjustable rotary switch.
B. set screen adjustment device.
C. two-position selector.
D. combination of several push-buttons.
ANSWER: C

Code: C-011-2-C2
202. If the programmed speed to machine aluminum is 3250 RPM (with coolant) and aluminum is building up on the cutter, which override percentages should be selected?
A. 10%
B. 30
C. 75%
D. 120
ANSWER: C

Code: C-011-3-C2
203. If the programmer mistakenly programmed a speed rate for a twist drill that is causing the drill to become prematurely dull. Assuming the chip load is correct, which of the percentages below would you select using the speed override?
A. 25%
B. 50%
C. 75%
D. 120%
ANSWER: D

Objective # 69
Task: Control feedrate override.

Code: C-012-2-C1
204. A variable manual control function used to reduce or increase the programmed feedrate is called the:
A. spindle override.
B. spindle bypass.
C. feedrate override.
D. feedrate bypass.
ANSWER: C

Code: C-012-2-C1
205. When making an interrupted cut on a lathe, what action would be required to maintain a sharp cutting tool?
A. Decrease the speed, maintain the feed.
B. Decrease the feedrate as required.
C. Increase the feedrate as required.
D. Increase speed and feedrates.
ANSWER: B

Code: C-012-1-C2
206. If the feedrate override is set at 115% and the original feed was programmed at 12.5 IPM, what is the actual feedrate?
A. 10.7 IPM
B. 14.4 IPM
C. 15.3 IPM
D. 16.5 IPM
ANSWER: B

Code: C-012-2-C2
207. If the feedrate format for a particular machine tool is "F21", as defined in the user manual, and the programmed feedrate is 29.7 IPM, what would the display look like?
A. 029
B. 290
C. 297
D. 970
ANSWER: C

Objective # 70
Task: Activate automatic cycle mode.

Code: C-013-2-C1
208. If a part program is written from the exact center of the part, which of the set-up techniques below would provide the greatest accuracy?
A. Layout part, scribe centerlines, and pick up the location with a centering-tool.
B. Use an edge finder and jog to the proper location.
C. Measure from the edge of the part to a tool in the spindle, using a depth micrometer, and jog into location.
D. Pick up the edges of the part with a dial indicater while jogging into location.
ANSWER: D

Code: C-013-4-C1
209. If a tool change was located in block 220, what word from the line below would define that block number?
A. X2.20
B. T22
C. N220
D. Z-220
ANSWER: C

Code: C-013-4-C1
210. In what position should the program number be located in order to assure the operator that it is the correct program?
A. Embedded in the program - the first line.
B. Typed in manual readable code on the tape leader.
C. On the support documents - prints, work orders, etc.
D. Taped on the plastic box containing the tape.
ANSWER: A

Code: C-013-4-C1
211. Before activating the automatic cycle to begin the machining process, what should be done to insure that there is no possibility of collision between the part and cutter?
A. Measure clearances with a tape measure.
B. Read the program thoroughly.
C. Determine clearances visually without part motion.
D. Dry-run the program with clearances between part and cutter.
ANSWER: D

Objective # 71
Task: Interrupt automatic cycle mode manually.

Code: C-014-1-C1
212. The main purpose for using the single-step feature of the automatic cycle mode is to:
A. save electricity and wear-and-tear on the machine.
B. insure that the machine is operational in automatic mode.
C. verify the cutter motion, block-by-block.
D. make sure the cutting tool is tight in the spindle.
ANSWER: C

Code: C-014-2-C1
213. Which of the control functions listed below should be activated to immediately stop table motion and monitor location of the table during the machining of a component:
A. feed-hold function.
B. feedrate override function.
C. emergency stop function.
D. spindle-off function.
ANSWER: A

Code: C-014-3-C1
214. If during the machining of a part the cutter breaks and imposes an immediate safety problem to the operator, which control function should be activated?
A. The spindle speed override function.
B. The emergency stop function.
C. The feed hold function.
D. The feedrate override function.
ANSWER: B

Objective # 72
Task: Set manual mode control.

Code: C-015-1-C1
215. What is the first step in changing modes from automatic to manual?
A. Change to single step mode.
B. Decrease spindle speed and feedrate in automatic mode.
C. Set the control to edit mode.
D. Stop the execution of the automatic mode.
ANSWER: D

Code: C-015-3-C1
216. A means of inserting data manually into the control system is called manual:
A. interpolation.
B. data input.
C. block diagram.
D. block scan.
ANSWER: B

Objective # 73
Task: Select cycle modifiers.

Code: C-016-1-C1
217. Which one of the following lines of code would most likely require modification during the running-off of the first path?
A. N2090 G84 X2.Y1.Z.44F84
B. N1115 G77 X2.Y1.Z.44F100
C. N20 G0G90 X2.TIM6
D. N505 G01 X2.Y1.Z.05F20
ANSWER: A

Code: C-016-3-C1
218. A sequence of operations that is repeated regularly is called a:
A. deck.
B. verifier.
C. cycle.
D. interlock.
ANSWER C

Objective # 74
Task: Select manual feed/jog mode.

Code: C-017-4-C1
219. A control function which provides for the momentary operation of a drive for the purpose of accomplishing a small movement of the driven machine is known as a:
A. jog.
B. lag.
C. patch.
D. tab.
ANSWER: A

Code: C-017-7-C1
220. The purpose of the manual feed/jog mode is to:
A. Stop the program run in the middle of a cycle.
B. Reset the CNC machine's original setpoint.
C. Transfer control of machine movement to operator.
D. Automatically change machine tool location.
ANSWER: C

Code: C-017-8-C1
221. A variable manual control function used to reduce or increase the programmed feedrate is called the feedrate:
A. bypass.
B. dial.
C. emulator.
D. override.
ANSWER: D

Objective # 75
Task: Adjust cutter compensation.

Code: C-018-1-C1
222. The preparatory function code for a cutter-compensation portion of a program is G41. This information indicates that the displacement normal to the programmed cutter path will be:
A. maintained at the original programmed path.
B. .41 of the original diameter.
C. to the right of the programmed path.
D. to the left of the programmed path.
ANSWER: D

Code: C-018-2-C1
223. What does the preparatory function code, G42, for cutter compensation indicate?
A. A change of .42 of the original diameter.
B. Displacement to the left of the original path.
C. Displacement to the right of the original path.
D. Termination of cutter-compensation mode.
ANSWER: C

Code: C-018-5-C1
224. What does the preparatory function code, G40, for cutter compensation indicate?
A. Termination of cutter compensation mode.
B. Displacement normal to the left of the original path.
C. Displacement normal to the right of the original path.
D. Maintenance of the original path.
ANSWER: A

Code: C-018-3-C2
225. If the programmed cutter diameter is .500 and the actual cutter measures .484, which of the values listed below should be input as cutter compensation?
A. -.008
B. -.016
C. +.008
D. +.016
ANSWER: B

Code: C-018-3-C1
226. If during the execution of a program in automatic mode, a cutter-compensation value must be changed, which of the techniques listed below is the most efficient means of entering the value?
A. Add a new situation into the original tape.
B. Use the MOP feature.
C. Use the tool length offset feature.
D. Use the MDI feature.
ANSWER: D

Code: C-018-3-C2
227. What is the new feedrate to be input when a program using a programmed cutter at a 3/4" diameter cut modified to use a 1/2" diameter, 2-fluted H.S.S. cutter?
A. 1.7 IPM
B. 3.4 IPM
C. 6.9 IPM
D. 9.2 IPM
ANSWER: C

Objective #76
Task: Edit program.

Code: C-019-1-C1
228. A CNC machine mode which allows the CNC program to be changed is called the:
A. create mode.
B. alter mode.
C. edit mode.
D. modify mode.
ANSWER: C

Code: C-019-3-C1
229. On most CNC machines complex program changes are verified by a:
A. dry run of the program.
B. check of the first produced part.
C. check of the punched tape.
D. rewrite of the programmed manuscript.
ANSWER: A

Code: C-019-2-C1
230. The edit mode is generally a part of what mode:
A. tape create.
B. program.
C. manuscript.
D. duplex.
ANSWER: B

Objective # 77
Task: Run segment of program.

Code: C-020-2-C1
231. A number identifying the relative location of blocks or groups of blocks on a tape is called a what kind of number?
A. read
B. sequence
C. track
D. position
ANSWER: B

Code: C-020-4-C1
232. A word or group of words in a CNC program identified by an "O" or "H" in place of the word address "N" and containing sufficient data to enable resumption of the program following an interuption is called a:
A. canned cycle.
B. auxiliary function.
C. adaptive control.
D. reference block.
ANSWER: D

Code: C-020-3-C1
233. A display of the number of the block of tape being read by the tape reader is called the sequence:
A. monitor.
B. readout.
C. resolution.
D. description.
ANSWER: B

Objective # 78
Task: Perform sequence search.

Code: C-021-3-C1
234. When performing a sequence search the sequence number is located as what word of every block?
A. first
B. second
C. third
D. fourth
ANSWER: A

Code: C-021-2-C1
235. A CNC machine feature which permits selected blocks of tape to be ignored by the control system, at the operator's discretion is called:
A. block inversion.
B. block delete.
C. cycle inversion.
D. cycle delete.
ANSWER: B

Code: C-021-5-C1
236. After performing a sequence search and editing the program the operator should:
A. shut down the system.
B. make a new CNC tape.
C. run and observe the program.
D. verify tool location and start up point.
ANSWER: D

Objective # 79
Task: Interpret status lights.

Code: C-022-1-C1
237. The main function of status lights on the control panel is to:
A. eliminate programming errors.
B. display system status and fault conditions.
C. identify the features in operation.
D. notify operator of programming errors.
ANSWER: C

Code: C-022-2C-C1
238. When a programming status light is off it signifies that the function/feature is:
A. active.
B. disabled.
C. not programmed.
D. malfunctioning.
ANSWER: B

Code: C-022-3-C1
239. A lit E-stop status light usually denotes a:
A. error condition.
B. end of tape.
C. edit mode.
D. emergency stop.
ANSWER: D

Objective #80
Task: Change spindle speeds.

Code: C-023-1-C1
240. A multiple-character code containing the letter S followed by 4 digits is called:
A. spindle speed.
B. software select.
C. sequence number.
D. speed suppression
ANSWER: A

Code: C-023-1-C1
241. The code normally used for a oriented spindle stop is:
A. M01
B. M05
C. M19
D. M29
ANSWER: B

Code: C-023-4-C1
242. A speed measuring instrument generally used to determine revolutions per minute (RPM) is called a:
A. scanner.
B. tachometer.
C. post processor.
D. interferometer.
ANSWER: B

Code: C-023-3-C1
243. The spindle speed override is normally a:
A. push button.
B. toggle switch.
C. two-way indicator.
D. rotary selector.
ANSWER: D

Objective # 81
Task: Initiate program restart from zero (absolute mode).

Code: C-024-2-C1
244. All dimensions input into the control are referenced from a single zero point, representing what mode ?
A. absolute.
B. incremental.
C. linear.
D. circular.
ANSWER: A

Code: C-024-1-C1
245. The position established by an operator as the starting point for a program on a CNC machine is called:
A. program start.
B. setpoint.
C. sequence point.
D. block format.
ANSWER: B

Objective # 82
Task: Interrupt cycle.

Code: C-025-1-C1
246. A break in the execution of a sequential program or routine to permit processing of high priority data is known as:
A. jump.
B. lag.
C. interrupt.
D. feedback.
ANSWER: B

Code: C-025-1-C1
247. A sequence of operations that is repeated regularly resulting in a particular machining function is called a:
A. canned cycle.
B. command cycle.
C. block interchange.
D. fixed format.
ANSWER: A

Code: C-025-3-C1
248. If an operator selected a G80 preparatory code they have selected what cycle:
A. cancel.
B. re-start.
C. drill.
D. tap.
ANSWER: A

Objective # 83
Task: Check cutting fluids.

Code: C-026-1-C1
249. Which is <u>not</u> an acceptable method for determining cutting fluid level:
A. sight guage.
B. status light.
C. dial indicator.
D. remove reservoir cover.
ANSWER: D

Code: C-026-2-C1
250. To stop the coolant flow the operator would enter what M-code?
A. M01
B. M05
C. M09
D. M14
ANSWER: C

Objective # 84
Task: Check surface finish.

Code: C-027-3-C1
251. A measuring device used for determining piece part finish tolerances.
A. Dial indicator.
B. Surface tester.
C. Micrometer.
D. Profilometer.
ANSWER: D

Code: C-027-3-C1
252. The first step when measuring a piece part finish is to:
A. measure piece part edge.
B. clean part throughly.
C. check finish for flaws.
D. measure center of piece.
ANSWER: B

Code: C-027-3-C1
253. When checking surface finish, surface texture refers to what characteristic of metal
A. interior effects.
B. exterior effects.
C. tolerance specifications.
D. residual stress.
ANSWER: B

Objective # 85
Task: Measure cut dimensions.

Code: C-028-2-C1
254. When removing a cut part piece the first thing the operator should do is:
A. check for burrs.
B. clean part.
C. put on gloves.
D. release clamps.
ANSWER: C

Code: C-028-3-C1
255. Before measuring part piece cut dimensions, the operator should:
A. remove burrs.
B. clean part.
C. check finish tolerances.
D. check part for flaws.
ANSWER: A

Objective # 86
Task: Index turret.

Code: C-029-1-C1
256. A device for tool storage from which the CNC machine can select tools automatically.
A. Table.
B. Turret.
C. Loader.
D. Assembler.
ANSWER: B

Code: C-029-3-C1
257. Moving the turret to a specific turret station is known as:
A. turning.
B. justifying.
C. indexing.
D. coordinating.
ANSWER: C

Code: C-029-2-C1
258. Another name for the tool turret is a tool:
A. drum.
B. bus.
C. loader.
D. processor.
ANSWER: A

Objective # 87
Task: Differentiate between machine controls.

Code: C-030-2-C1
259. A portion of the computer which may be used to control the machine manually, correct errors, determine the status of machine circuits, registers, and counters, determine the contents of storage, and manually revise the contents of storage is called the:
A. processor/postprocessor.
B. console/control panel.
C. compiler/assembler.
D. sequence/channel.
ANSWER: B

Code: C-030-2-C1
260. A group of lighted pushbuttons on the control panel which activate certain machine functions for operation as directed by the programming input medium is commonly called the:
A. program group.
B. control group.
C. status group.
D. display group.
ANSWER: A

Code: C-030-3-C1
261. A red pushbutton indicator on the control panel which causes an immediate controlled stop of machine tool movement, and axis motion followed by a spindle stop with no loss of information or synchronization between the machine tool and control is the:
A. e-stop
B. emergency stop
C. cycle stop
D. control off
ANSWER: C

Objective # 88
Task: Set Cycle Dwell.
Code: C-031-3-C1
262. The preparatory code normally used to set a cycle dwell is:
A. G05
B. G22
C. G61
D. G82
ANSWER: D

Code: C-031-3-C1
263. A timed delay of programmed or established duration before a sequence of operations are performed is called a:
A. feedback loop.
B. dwell cycle.
C. input resolution.
D. dynamic gain.
ANSWER: B

Code: C-031-3-C1
264. The amount of dwell time is usually set by a:
A. CNC punched tape.
B. Programmed "G" code/word.
C. Selector switch on control panel.
D. Programmed "M" code/word.
ANSWER: D

Objective # 89
Task: Modify manual data input program.

Code: C-032-4-C1
265. A means of inserting data manually into the control system.
A. DMA
B. MDI
C. DNC
D. APT
ANSWER: B

Code: C-032-5-C1
266. In the manual data input mode the system is completely controlled by the:
A. operator.
B. assembler.
C. post-processor.
D. programmer.
ANSWER: A

Code: C-032-8-C1
267. The main downfall of the manual data input mode is:
A. accuracy.
B. human error.
C. speed.
D. convenience.
ANSWER: B

Objective # 90
Task: Adjust depth of cut.

Code: C-033-1-C1
268. When adjusting depth of cut, rapid advance refers to the what motion of the tool:
A. horizontal.
B. upward.
C. downward.
D. vertical.
ANSWER: C

Code: C-033-1-C1
269. The method most commonly used with operator (manual) depth selection is to manually set several pairs of:
A. cams
B. axis
C. speeds
D. depths
ANSWER: A

Code: C-033-1-C1
270. When programming depth of cut the operator enters a two-digit cam number word preceded by the letter:
A. G
B. M
C. Z
D. W
ANSWER: D

Code: C-033-2-C1
271. A manual cam code which does not have a setting position is:
A. W00
B. M00
C. G00
D. U00
ANSWER: D

Objective # 91
Task: Reset tool cycle time.

Code: C-034-5-C1
272. The period required for a complete tooling action/ operation is called:
A. dedicated time.
B. encoded time.
C. cycle time.
D. logic time.
ANSWER: C

Code: C-034-4-C1
273. In order to program a tool cycle time accurately, the operator must determine the:
A. tool size.
B. predicted tool life.
C. program length.
D. type of CNC machine.
ANSWER: B

Code: C-034-2-C1
274. Tool cycle time should be reset whenever:
A. the tool is sharpened.
B. a new workpiece is started.
C. machine operators change.
D. the tool has 20 working hours.
ANSWER: A

Objective # 92
Task: Remove chips.

Code: C-035-2-C1
275. During the machining operation loose metal chips are usually removed from the CNC machine by the:
A. janitor.
B. chip conveyor.
C. chip rake.
D. coolant flow.
ANSWER: B
Note: Not all CNC machines have chip conveyors.

Code: C-035-3-C1
276. After the machining operation is complete and the machine is locked in the OFF position, chips may be removed by using:
A. air hose.
B. chip rake or tool.
C. operator's hand (with glove on).
D. shop towel.
ANSWER: B

Code: C-035-3-A1
277. Match the protective equipment to its safety function.

Protective Equipment	Safety Function
1. Safety glasses	a. Reduce noise decibles.
2. Safety gloves	b. Provide eye protection.
3. Safety shoes	c. Protect clothing and body from spills and flying metal chips.
4. Safety helmet	d. Guard against head injury.
5. Approved ear plugs	e. Warn workers of dangerous areas.
6. Approved shop apron	f. Protect arms and hands from cuts and abrasions.
	g. Protects operator from moving or exposed machine parts.
	h. Prevent falls and foot injuries.

ANSWERS: 1-b, 2-f, 3-h, 4-d, 5-a, 6-c.

Code: C-035-2-C1
278. Which of the following personal protective equipment is not essential when cleaning the machine area?
A. Safety glasses.
B. Safety gloves.
C. Safety shoes.
D. Approved earplugs.
ANSWER: D

Objective # 93
Task: Execute emergency stop.

Code: C-036-1-C1
279. A pushbutton which when depressed immediately stops the feed of all axes and if the spindle is on it will coast to a stop. The machine must be restarted and realigned before operation can be resumed.
A. cycle stop.
B. emergency stop.
C. spindle stop.
D. axes stop.
ANSWER: B

Code: C-036-3-C1
280. After the emergency stop button has been activated the machine controls are what until the fault or data reset is activated.
A. totally functional
B. partially functional
C. totally inactive
D. partially inactive
ANSWER: C

Objective # 94
Task: General Safety Rules.

Code: C-037-NA-A1
281. Unsafe work conditions should be:
A. ignored by programmer.
B. reported to supervisor.
C. corrected by operator.
D. worked with carefully.
ANSWER: B

Code: C-037-NA-A1
282. Hand tools such as wrenches, measuring equipment, hammers, etc. should be:
A. removed from work area immediately after the machining operations is complete.
B. removed from machine and placed on floor out of way until needed.
C. removed from work area immediately after usage.
D. placed on machine table out of the tool path.
ANSWER: C

Code: C-037-NA-A1
283. Store cutters and tools:
A. where ever they fit best.
B. with cutting edges down.
C. with cutting edges up.
D. wrapped in paper.
ANSWER: B

Code: C-037-NA-A1
284. The CNC machine and work area should be cleaned how often to maintain a safe working environment?
A. daily
B. weekly
C. after each use
D. as often as necessary
ANSWER: D

Code: C-037-NA-A1
285. Safety guards, shields, barriers, covers and protective devices:
A. must be connected at all times.
B. can be removed to speed machining.
C. must be connected only when operating machine.
D. can be used at the operators discreation.
ANSWER: A